

CHAPTER 3 PROJECT

Demand Curves and Revenue

The graph of the relationship between the price p of a given product and the quantity x of that product sold is called the **demand curve** for the product. It typically reflects the fact that an increase in price results in lower sales and a decrease in price results in higher sales. The revenue realized by selling quantity x of the product at price p is then given by the function $R(x) = xp$.

1. One common relationship between p and x is an equation of the form

$$p + bx = a,$$

where a and b are positive constants.

- a. With the horizontal axis representing x and the vertical axis representing p , sketch the general shape of the demand curve associated with this relationship. (**Hint:** It may help to initially pick specific values for a and b in order to identify the behavior.)
- b. In words, how would you describe the dependence of p on x ?
- c. What value of x corresponds to the largest feasible value for p ?
- d. What value of p corresponds to the largest feasible value for x ?
- e. Find a formula for the revenue function $R(x)$ as a function of x alone.
- f. What class of function is $R(x)$?
- g. How would you describe the graph of $R(x)$?

2. Another common relationship between p and x is an equation of the form

$$px = a,$$

where again a is a positive constant.

- a. With the horizontal axis representing x and the vertical axis representing p , sketch the general shape of the demand curve associated with this relationship. (It may again help to initially pick a specific value for a in order to identify the behavior.)
- b. What is the smallest feasible value for x in this relationship?
- c. What value of p corresponds to the smallest feasible value for x ?
- d. Is there a smallest feasible value for p in this relationship?
- e. Find a formula for the revenue function $R(x)$.
- f. What class of function is $R(x)$?
- g. How would you describe the graph of $R(x)$?